

NORTH CAROLINA: Elizabeth City, *Bro. Marcellus*. ALABAMA: Mobile, *Mohr*: Mobile Bay, *Mohr*. FLORIDA: *Curtiss* 5718, 4079; Jacksonville, *Hitchcock*. LOUISIANA: *Tracy et Lloyd*, Breton Island; St. Martinville, Pointe a la Hache, *Langlois*.

*C. POLYSTACHYOS* Rottb. var. *TEXENSIS* (Torr.) Fern. MASSACHUSETTS: *Fernald* 321; *Bacigalupi* 1910, 2127. MARYLAND: *O'Neill* 7193 and 9077; *Smith* 398. DISTRICT OF COLUMBIA: *Steele* 1896. VIRGINIA: *Heller* 1213. NORTH CAROLINA: Oak Island, Roxboro, 7228, White Lake, 33630A, *Blomquist*; *Oosting* 33593, 33753; *Correll*, 4856; Caswell County, Beaufort Co., Wake Co., Orange Co., Franklin Co., New Hanover Co., *Reed*. SOUTH CAROLINA: Frogmore, *Cuthbert*. GEORGIA: *Svenson* 7227; *Reade* E8049; *McVaugh* 61, 205; *Bartlett* 968, 1156. ALABAMA: St. Bernard, *Wolf*; Mobile, *Mohr*; Auburn, *Earle*. FLORIDA: *Correll*, 5582, 5593, 5635, 5722, 5781, 5783, 5809, 5862, 5872, 5873, 5898, 5934, 5891, 5944, 5951, 6080, 6302, 6338, 6364, 6424; *Leonard* 1123; *O'Neill* 2597, 5258, 5259, 5257, 5262, 5261, 7204, 7206, 1067; *Scott*, Palatka; *Tracy* 7005; *Curtiss* 3049, 4078, 5004; *Moldenke* 494, 588, 798, 1042, 5780; *Nash* 482, 1023, 2494; *Deam* 1927, 2754; Eustis, *Hitchcock*; Ft. Myers, *Standley*; *McFarlin* 4718; Winter Park, *Uphof*; Jacksonville, *Leeds*; *Rugel* 606; Tampa, *Ferguson*; Gainesville, *Chester*; Naples, *Rhodes*. ARKANSAS: *Heller* 4131. TENNESSEE: *Svenson* 4372. MISSISSIPPI: Horn Island, *Seymour*; Ocean Springs, *Macfarlane*; Biloxi, *Tracy*; *Seymour* 7. LOUISIANA: *Palmer* 8943; Pointe a la Hache, St. Martinville, *Langlois*. TEXAS: *Tharp* 1766, 4629, 1777, 3204, 3203, 9184, 3043; San Jacinto River, 2373, *Tharp*; Texarkana, *Letterman*; Galveston, *Fisher*; Crosby, *Fisher*; *Cory* 20317, 30318, 20454; *Young* 7; *Ottine*, 6264, *Bogusch*; *Hall* 676; *Reverchon* 2283A; *Palmer* 10630; Angelina Co., *Boon*. MEXICO: *Gentry* 2045, 2040; *Salitral* 1576; Vera Cruz, *Fisher*. CUBA: *Wilson* 487, 1282, 1663, 1546; *Baker* 2417, 3543, 3450; *Shafer* 125; *Van Hermann* 131. CENTRAL AMERICA: *Lundell* 4740, 5004, 7004; *O'Neill* 8993, 8994, 8995, 8992; *Gentle* 1934; *Schipp* 920. BRAZIL: *Martius* 18880. ARGENTINA: *Venturi* 7116.

LANGLOIS HERBARIUM

CATHOLIC UNIVERSITY OF AMERICA

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## FURTHER NOTES ON COASTAL FLORAL ELEMENTS IN THE BOGS OF AUGUSTA COUNTY, VIRGINIA

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UPON examining the flora in southeastern Augusta County on the west slope of the Blue Ridge, there is noted a distinct and characteristic coastal floral element in association with other interesting plants primarily of the uplands, which are also considered in the discussion.

The area affords varied habitats for the coastal species in its ponds, bogs, and grassy meadows.

The ponds are situated at an altitude of 1600 feet and represent filled-in limestone sinks that are fed by numerous springs. However, there is no outcropping of limestone here, for this is completely covered by sandy wash and talus at the foot of the Blue Ridge. The coastal species appear to be assembled around six general pond-centers with the exception of Magnolia Swamp—Blue Pond, Spring Pond, Lipscomb Pond, Mountain Lake (Shenandoah Acres), Green Pond, and Hattan's Pond regions. A marked difference is noted in the vegetative aspects of these regions.

Blue Pond has growing near its edge *Utricularia radiata* Small and several species of *Potamogeton*. Nearby there is an extensive meadow of *Woodwardia virginica* (L.) Smith and *Hypericum petiolatum* Walt.

Spring Pond lies in the heart of the flatwoods and is well hidden by the shrubby overgrowth on its edge. *Orontium aquaticum* L. is the predominant growth in the rather shallow expanse. *Utricularia geminiscapa* Benj. (*U. clandestina* Nutt.) adheres to the gelatinous stems of *Brasenia Schreberi* Gmel. *Utricularia gibba* L. is also present. Intermediate between the shrubby edge and the body of water are sphagnum hummocks on which grow *Panicum hemitomon* Schultes, *Scirpus subterminalis* Torr., *Eriocaulon septangulare* With., *Xyris torta* Sm. (*X. flexuosa* of the Manuals, not Muhl.), *Arethusa bulbosa* L., *Calopogon pulchellus* (Sw.) R. Br., and *Eupatorium verbenaeifolium* Michx. The shrubby edge contributes *Rhododendron viscosum* (L.) Torr., *Viburnum nudum* L. and *Gaylussacia dumosa* var. *Bigeloviana* Fernald. In nearby cranberry meadows are *Rhexia mariana* L., *R. virginica* L., *Sabatia gracilis* (Michx.) Salisb., *Solidago tenuifolia* Pursh, *Helenium virginicum* Blake, and *Panicum virgatum* L. *Spiranthes Beckii* Lindl. occurs here especially in sandy, rocky spots along the roads that are used for transporting wood from the mountains. *Lygodium palmatum* (Bernh.) Sw. climbs over *Benzoin aestivale* (L.) Nees along the mountain creeks.

Around Lipscomb Pond in the same general region there is an interesting find. *Solidago graminifolia* var. *polycephala* Fernald occurs along a stream running from the pond in which grows *Utricularia radiata*. Lipscomb Pond is exposed, lying amid apple trees.

Mountain Lake (Shenandoah Acres) with its adjoining meadows contributes many significant plants to the coastal list. On its sandy

edge in five or six inches of water are *Eleocharis melanocarpa* Torr., *Utricularia fibrosa* Walt., and *Xyris caroliniana* Walt. In the adjoining grassy and sedgy meadows appear *Calamagrostis cinnoides* (Muhl.) Barton, *Rynchospora gracilentata* Gray, *Carex sterilis* Willd., *C. Mitchelliana* M. A. Curtis, *Juncus dichotomus* var. *platyphyllus* Wiegand, and *Juncus scirpoides* Lam. Throughout the meadows, amid cranberry vines *Habenaria lacera* (Michx.) R. Br., *H. ciliaris* (L.) R. Br., *Calopogon pulchellus*, *Aletris farinosa* L., and *Xyris torta* predominate. The shrubby aspects of the meadow are characterized by *Hypericum densiflorum* Pursh, *Prunus cuneata* Raf., and *Gaylussacia dumosa* var. *Bigeloviana*. In the dryer portions of the meadow, in white sand, *Desmodium sessilifolium* (Torr.) T. and G. appears, as a new record for the state. In similar habitats *Comandra umbellata* (L.) Nutt., *Rhexia mariana* and *R. virginica* are found.

Green Pond differs from the other regions in possessing an expanse of water that is totally covered with *Nymphaea advena* Ait. However, on the edge coastal species are represented by *Hibiscus palustris* L., *Lysimachia radicans* Hook., *Stachys hyssopifolia* Michx. and *Hypericum petiolatum*. Green Pond is hidden in the flatwoods by numerous oaks, persimmons, gums, and pines. In several semipermanent ponds, *Isoetes virginica* Pfeiffer, *Helenium virginicum* and *Juncus debilis* Gray are found.

The Hattan's Pond region comprises a much overgrown grassy, cranberry meadow. *Lachnanthes tinctoria* (Walt.) Ell. is here as a relic of a tropical family once widespread in Eastern U. S., but now confined to the coastal strip in the U. S. *Glyceria obtusa* (Muhl.) Trin. is a conspicuous grass in the meadow flora.

Magnolia Swamp affords great interest for the botanist in its varied floral elements. *Magnolia virginiana* L., *Ilex verticillata* (L.) Gray, and *Pinus rigida* Mill. are characteristic plants of the wooded portion. Beneath the arboreal growth *Helonias bullata* L., another member of a once widespread flora, is rooted in black muck. The meadow portion furnishes mucky soil permanently water-soaked, for *Scleria reticularis* var. *pubescens* Britton, *Carex Longii* Mackenz., *C. debilis* var. *pubera* Gray, *Sisyrinchium atlanticum* Bick., *Oenothera fruticosa* var. *vera* Hook., and *Xyris torta* and *Utricularia subulata* L. *Panicum longifolium* Torr. is an interesting representative of the coastal grass flora.

An explanation of the appearance of this coastal flora in the flat-

woods of the Blue Ridge and farther out in the valley province requires a survey of the physiographic history of the provinces concerned.

Since Cretaceous and early Tertiary time to the present the flatwoods of the Blue Ridge and the Shenandoah Valley proper have undergone cycles of erosion. Watson and Cline define four cycles of erosion. During Cretaceous times the entire Appalachian Upland was reduced to a peneplain (Kittatinny Cycle). An uplift of the Kittatinny Plain rejuvenated the stream and a second cycle of erosion was inaugurated in early Tertiary.

At the close of the Tertiary Cycle streams were rejuvenated by uplift of the region and a new cycle designated as the Shenandoah was begun, which resulted in the development of the Shenandoah plain in the valley limestone.

A third uplift of the region brought the Shenandoah cycle of erosion to a close, and thus was entered upon a new or recent cycle of erosion in early Pleistocene.

The presence of a widespread peneplain comprising the Appalachians during Cretaceous and early Tertiary times afforded conditions for a widespread flora that as yet had not been segregated into distinct categories correlated with provinces. Thus those species that are now termed coastal were widespread until subsequent uplifts brought about a change in the floral aspects of the Appalachian Uplands. The hydrophytic types accustomed to low, swampy, siliceous conditions were forced to retreat. But in certain regions of the Appalachians where grassy meadows, ponds, and bogs abound, coastal species exist as remnants of a widespread flora. Professor Fernald has graphically presented the residual idea in several of his recent papers. It appears significant to state some of his opinions here. "The Coastal Plain flora of Atlantic North America is distinguished by the abundance of tropical groups represented. Although these plants now chiefly occupy siliceous, peaty and aquatic habitats in comparatively youthful regions of eastern North America, it is probable that they or their progenitors formerly existed on the area of the ancient Appalachian Upland, especially in the Cretaceous, when that primitive region of the continent was base-leveled and reduced essentially to sea-level and at the time when the tropical groups of today were widespread in the North. Then with the Tertiary uplift of the Appalachian region and its final conversion into a vast well-drained mesophytic area

available to the groups which now constitute the climax forests of the Appalachian Upland, the Cretaceous xerophytes and hydrophytes which had previously occupied the ground gradually moved out to the newly available and for them more congenial Coastal Plain and similar habitats to the west and northwest."

So it appears that the physiographic features have been favorable for the maintenance of the now recognized coastal types that were once spread as a partially cosmopolitan flora during Cretaceous and Tertiary times.

#### SUMMARY OF SPECIES BY REGIONS

##### BLUE POND

*UTRICULARIA RADIATA* Small. Floating in water. Inflated petioles conspicuous. No. 129 (Gray Herb. and Va. Flora Herb., at U. Va.).

*WOODWARDIA VIRGINICA* (L.) Smith. Radiates from semipermanent ponds forming a very thick growth, so as to exclude other plants from its place of dominance.

*HYPERICUM PETIOLATUM* Walt. Moist sandy situations around semipermanent ponds that merge into meadow-like situations.

##### SPRING POND

*ORONTIUM AQUATICUM* L. Dominant throughout shallow expanse.

*UTRICULARIA GEMINISCAPA* Benj. (*U. clandestina* Nutt.). Floating and adhering to stems of *Brasenia Schreberi*. No. 382 (Gray Herbarium and Virginia Flora Herb., U. Va.); no. 316 (U. of Penn. Herb.).

*BRASENIA SCHREBERI* Gmel. Intermingled with *Orontium aquaticum*, near edge of pond. No. 24 (Va. Flora Herb., U. Va.).

*UTRICULARIA GIBBA* L. Attached to pieces of old logs, sphagnum and stems of other aquatics. No. 128 (Va. Flora Herb., U. Va.).

*PANICUM HEMITOMON* Schultes. Sphagnum situations, in slight abundance.

*SCIRPUS SUBTERMINALIS* Torr. Aquatic on edge of pond.

*ERIOCAULON SEPTANGULARE* With. Growing at varied depths from edge outward among *Potamogeton*. No. 21 (Gray Herbarium).

*XYRIS TORTA* Smith (*X. flexuosa* of the manuals, not Muhl.). Rooted in sphagnum hummocks.

*ARETHUSA BULBOSA* L. In peaty soil on edge of pond, ample shade. No. 54 (Va. Flora Herb., U. Va.).

*CALOPOGON PULCHELLUS* (Sw.) R. Br. In sphagnum. No. 61 (Va. Flora Herb., U. Va.).

*EUPATORIUM VERBENAEFOLIUM* Michx. In sphagnum hummocks bordering pond. No. 361 (Gray Herb. and Va. Flora Herb., U. Va.).

*RHODODENDRON VISCOSUM* (L.) Torr. Comprising shrubby growth on edge of pond.

*VIBURNUM NUDUM* L. Intermingled with *Rhododendron viscosum*. No. 407 (Va. Flora Herb., U. Va.); no. 408 (Gray Herb.).

GAYLUSSACIA DUMOSA var. BIGELOVIANA Fernald. Edge of pond. No. 138 (Va. Flora Herb., U. Va.).

RHEXIA MARIANA L. Moist swampy meadow in flatwoods. No. 11 (Gray Herbarium); no. 389 (Va. Flora Herb., U. Va.).

RHEXIA VIRGINICA L. Intermingled with the last species. No. 13 (Va. Flora Herb.).

SABATIA GRACILIS (Michx.) Salisb. Growing in meadows with *Rhexia*. No. 9 (Va. Flora Herb., U. Va.); no. 10 (Gray Herb.).

SOLIDAGO TENUIFOLIA Pursh. In grassy sandy meadows, inundated for a part of the year. No. 310 (Gray Herb.).

HELENIUM VIRGINICUM Blake. Type locality, growing in meadow with *Rhexia* and *Sabatia*. No. 139 (Gray Herb.).

PANICUM VIRGATUM L. Open meadows in flatwoods. No. 315 (U. of Penn.); no. 384 (Gray Herb.).

SPIRANTHES BECKII Lindl. On sandy banks and along woodland roads. No. 56 (Gray Herb.).

LYGODIUM PALMATUM (Bernh.) Sw. Climbing over shrubs along Kennedy Creek. No. 67 (Gray Herb.).

#### LIPSCOMB POND

SOLIDAGO GRAMINIFOLIA var. POLYCEPHALA Fern. Open territory near pond. No. 349 (Gray Herb.).

UTRICULARIA RADIATA Small. Floating in pond among *Potamogeton*.

#### MOUNTAIN LAKE (SHENANDOAH ACRES)

ELEOCHARIS MELANOCARPA Torr. Rooted to sandy edge of lake in five or six inches of water. Nos. 422, 436, 499 (Gray Herb.).

UTRICULARIA FIBROSA Walt. In association with the above species. No. 130 (Va. Flora Herb., U. Va.); no. 490 (Gray Herb.).

XYRIS CAROLINIANA Walt. On sandy edge of lake in sphagnum and in water. No. 293 (U. of Penn.); no. 398 (Gray Herb.).

CALAMAGROSTIS CINNOIDES (Muhl.) Barton. Growing from extensive areas of *Carex strictior* Dewey. No. 497 (Gray Herb.).

RYNCHOSPORA GRACILENTA Gray. Boggy meadows adjoining lake. No. 303 (Gray Herb. and U. of Penn.).

CAREX STERILIS Willd. Growing with the above species. No. 492 (Gray Herb.).

CAREX MITCHELLIANA M. A. Curtis. In boggy meadow. No. 350 (Va. Flora Herb., U. Va.).

JUNCUS DICHOTOMUS var. PLATYPHYLLUS Wiegand. With other sedges in grassy meadows. No. 403 (Gray Herb.).

JUNCUS SCIRPOIDES Lam. Growing in cranberry meadows. No. 500 (Gray Herb.).

HABENARIA LACERA (Michx.) R. Br. In moist situations with sedges.

HABENARIA CILIARIS (L.) R. Br. In moist sphagnous situations. No. 473 (Gray Herb.).

CALOPOGON PULCHELLUS (Sw.) R. Br. Abundant in meadows adjoining lake.

ALETRIS FARINOSA L. In drier parts of meadows. No. 234 (Va. Flora Herb., U. Va.).

XYRIS TORTA Sm. (*X. flexuosa* of the Manuals, not Muhl.). On edge of lake in sphagnum. No. 194 (Va. Flora Herb., U. Va.).

HYPERICUM DENSIFLORUM Pursh. In very moist spots in meadow. No. 499 (Gray Herb.).

PRUNUS CUNEATA Raf. A low shrub in dry portions of meadows. No. 282 (Va. Flora Herb., U. Va.); no. 358 (Gray Herb.).

GAYLUSSACIA DUMOSA var. BIGELOVIANA Fernald. In drier parts of sandy meadows. No. 409 (Gray Herb.).

DESMODIUM SESSILIFOLIUM (Torr.) T. and G. On edge of lake radiating into the drier spots of the adjoining territory. No. 345 (Va. Flora Herb., U. Va.); no. 168 (U. of Penn. Herb.).

COMANDRA UMBELLATA (L.) Nutt. In sandy soil. No. 498 (Gray Herb.).

RHEXIA MARIANA L. Edge of lake. No. 12 (Va. Flora Herb.).

RHEXIA VIRGINICA L. Edge of lake. No. 175 (Gray Herb.).

#### GREEN POND

NYMPHAEA ADVENA Ait. Occupying major portion of pond.

HIBISCUS PALUSTRIS L. (*H. Moscheutos* L.). On edge of pond. No. 136 (Va. Flora Herb., U. Va.); no. 292 (U. of Penn. Herb.); no. 362 (Gray Herb.).

LYSIMACHIA RADICANS Hook. In depressions near outlet. No. 360 (Gray Herb.).

STACHYS HYSSOPIFOLIA Michx. With the above species. No. 23 (Gray Herb.).

HYPERICUM PETIOLATUM Walt. Depressions on pond's edge. No. 291 (Gray Herb. and U. of Penn. Herb.).

ISOETES VIRGINICA Pfeiffer. Semipermanent ponds. No. 140 (Gray Herb.); no. 458 (Gray Herb.).

HELENIUM VIRGINICUM Blake. Semipermanent ponds with *Isoetes*. No. 309 (U. of Penn. Herb.).

JUNCUS DEBILIS Gray. With the *Isoetes*. No. 434 (Gray Herb.).

#### HATTAN'S POND

LACHNANTHES TINCTORIA (Walt.) Ell. In overgrown cranberry meadow. No. 20 (Gray Herb.); no. 294 (U. of Penn.).

GLYCERIA OBTUSA (Muhl.) Trin. With the Red Root. No. 314 (Gray Herb. and U. of Penn. Herb.).

#### MAGNOLIA SWAMP

MAGNOLIA VIRGINIANA L. Rather large inland colony. No. 99 (Gray Herb.); no. 146 (Va. Flora Herb., U. Va.).

*ILEX VERTICILLATA* (L.) Gray. Comprising a part of arboreal growth of the swamp. No. 115 (Va. Flora Herb., U. Va.).

*HELONIAS BULLATA* L. Growing in peaty soil below magnolias.

*SCLERIA RETICULARIS* var. *PUBESCENS* Britton. Occupying meadow portion of boggy spots. No. 451 (Gray Herb.); no. 304 (Gray Herb. and U. of Penn. Herb.).

*CAREX DEBILIS* var. *PUBERA* Gray. In boggy mire of meadow portion. No. 423 (Gray Herb.).

*SISYRINCHIUM ATLANTICUM* Bick. Intermingled with bog sedges. No. 428 (Gray Herb.).

*CAREX LONGII* Mack. In boggy meadow. No. 416 (Gray Herb.).

*OENOTHERA FRUTICOSA* var. *VERA* Hook. In sphagnum. No. 100 (Gray Herb.).

*XYRIS TORTA* Sm. In boggy meadow. No. 106 (Gray Herb.); no. 305 (U. of Penn. Herb.).

*UTRICULARIA SUBULATA* L. Beneath sedges rising from mucky level, slightly covered with water. No. 317 (U. of Penn. Herb.).

*PANICUM LONGIFOLIUM* Torr. In boggy areas. No. 455 (Gray Herb.).

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